WORKPLAN FOR IMPLEMENTATION DECISION UNIT PLAN SAMPLING AND ANALYSIS

Arkwood Inc. Site
Old Cricket Road
Omaha, Arkansas
August 29, 2014

Prepared For:

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1 INTRODUCTION

A Conceptual Site Model (CSM) was developed for the Arkwood, Inc. site ("Site") in Omaha, Arkansas. The CSM addresses polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) (IRIS, 2012; USEPA, 2009). A summary of 1995 post-excavation sampling data and 2012 sampling data is presented within the CSM and was utilized to develop "decision units" (DUs) for the Site. Furthermore, the CSM presents an approach for further soil sample collection to confirm PCDD/Fs concentrations for the decision units. The USEPA (2011) guidance for incremental composite soil sampling for PCDD/Fs was utilized to develop a set of seven areas that will be designated as separate DUs, each of which will be sampled using an the incremental sampling methodology (ISM) and one to ten composite samples of 30 to 40 increments will be collected from each DU, depending on its size and the expected heterogeneity of the PCDD/F concentrations in the DU.

These composite samples will be considered the representative soil concentration for each DU and will be used to evaluate risk assessment compliance for PCDD/Fs at the Arkwood, Inc. Site by comparing the maximum composite measurement for each DU to the dioxin soil screening level of 730 ppt TEQ.

The CSM report and incorporated figures and tables contain historical information regarding the past activities and information relevant to sources, transport pathways, and completed exposure routes that may be relevant to the Site operation and use conditions. The Site history is well-developed in other documents and reports and contained in the EPA online information for the Site. The post-remedial action sampling data and site characteristics that define potential soil exposure routes for risk assessment purposes are presented in the CSM.

2 DECISION UNIT PLAN

Figure 1 provides an overview of seven proposed areas corresponding to "decision units" (DUs) at this Site in accordance with USEPA (2011) guidance. Table 1 presents a summary of each DU, its surface area, the expected level of PCDD/F concentration heterogeneity, the number of incremental samples to be collected, and overview of the sampling approach for each DU. All of the proposed samples will be surface soil samples collected from 0-6 inches in depth.

DU #1 (Uncappped Area East) is the uncapped eastern section of the site where limited or no treated wood storage or processing activities were conducted based on available information and is shown in detail in Figure 2. Because this DU is approximately 1.2 acres in area, it will be divided into 5 sampling units (SU) of approximately 0.25 acres each. Three of the SU will be randomly selected and an incremental sample of 30 increments will be collected from each selected SU. The heterogeneity in PCDD/F concentrations is expected to be low to moderate in this area due to the limited past site activity.

DU #2 (Capped Area) is the capped area of the site that covers all of the formerly excavated areas; this DU will determine if there is any evidence of cap contamination that occurred during cap installation or due to cap breach after installation in 1995. This DU is shown in detail in Figure 3. This DU is the largest DU covering 82% of the site with an area of approximately 11 acres. Because of its size, this DU will be divided into 44 SU of approximately 0.25 acres each and eight SU of the 44 will be randomly selected for sampling. One incremental sample of 30 increments will be collected from each of the seven selected SU while three incremental samples of 30 increments each will be collected from the eighth selected SU. The heterogeneity in PCDD/F concentrations in this area is expected to be low given that the soil will be from the clean cap.

Figure 4 illustrates DU #3 (Storm Water Ditch North) and DU #4 (Storm Water Ditch South). DU #3 is the northern perimeter ditch area spanning from the natural berm area on the western side of the Site to the northeastern-most perimeter adjacent to a formerly excavated and capped area. This DU is approximately 0.14 acres in area and 467 meters in length. This DU will be divided in half lengthwise into two SU of approximately 233meters. One incremental sample of 40 increments will be collected from each SU. The increments will be collected from the bottom of the ditch approximately every six meters along the length of the DU. DU #4 is the southern perimeter ditch area that also spans from the natural berm area on the western side of the Site to the southeastern-most perimeter adjacent to a formerly excavated and capped area. This DU is approximately 0.17 acres in area and 560 meters in length. This DU will be divided in half lengthwise into two SU of approximately 280 meters. One incremental sample of 40 increments will be collected from each SU. The increments will be collected from the bottom of the ditch approximately every seven meters along the length of the DU. The heterogeneity in PCDD/F concentrations is expected to be moderate in this area due to the development of the storm water channels.

DU #5 (Berm Area) is the sedimentation zone and basin (natural berm area) formed by the confluence of the north and south perimeter ditches; this is the area where 2012 sampling events (independent samples, not composites) revealed soil concentrations of 328 ppt and 1,600 ppt TEQ. This DU is shown in Figure 5. This DU is bounded to the north by the fence line and to the south by the onsite road. The western boundary of the DU is set 10ft from the location of the 1,600 ppt TEQ sample and the eastern boundary is set 50ft from the same sample. The area of

this DU is approximately 12feet wide by 60 feet in length (approximately 0.02 acres). Three incremental samples of 30 increments will be collected from this DU. The heterogeneity in PCDD/F concentrations is expected to be moderate in this area.

Figure 6 shows DU #6 (Uncapped Area West), which is the uncapped area of the site between the entrance and the capped area (DU #2). This DU is about one acre in area and will be divided into 4 SU of approximately 0.25 acres each. One of the SU covers the area of the former truck decontamination pad where truck tires were washed before material from the site was hauled off-site during the remediation of the Site. Because there might a higher level of heterogeneity in this area, this SU will be sampled using three incremental samples of 30 increments. Two of the other three SU will be randomly selected and sampled using one incremental sample of 30 increments. The heterogeneity in PCDD/F concentrations is expected to be low to moderate in this area due to the lack of past site activity.

Figure 7 identifies DU #7 (Railroad Ditch) corresponding to the railroad ditch area that receives storm water overflow from the natural berm area of the site during exceptionally heavy rain events. This railroad ditch area is a relatively flat zone immediately downhill from the natural berm area and adjacent to the railroad tracks, with a slight grade eastward towards the railroad tunnel. Sampling over the span of this ditch area from the natural berm area to the railroad tunnel using the incremental composite sampling approach will evaluate offsite PCDD/F transport that might have occurred. This DU is bound to the south by the bottom of the hillside and to the north by the railroad track ballast. The western boundary for this DU is 20 feet west of the 1,600 ppt TEQ sample and the eastern boundary is 460 feet from the same sample and is the end of the former railroad ditch excavation area. One incremental sample of 30 increments will be collected from this DU. The heterogeneity in PCDD/F concentrations is expected to be low in this area.

3 SAMPLING METHODOLOGY

This section describes the tools/equipment and procedures for collecting the incremental soil samples and to prepare the samples for submittal to the analytical laboratory.

3.1 SAMPLING TOOLS AND EQUIPMENT

The soil sampling process will begin with hand-held soil coring tools. The coring implements will have a diameter of at least ¾ inch and the cores will extend to approximately six inches. The soil coring equipment will be marked to indicate a six-inch depth for consistency in sub-sample volume.

Sampling devices can be used within a DU without decontamination but will be decontaminated or disposed of between DUs. If sampling tools will be used for two or more DUs, they will be cleaned of soil particles, decontaminated with water and Alconox-type detergent and dried between DUs. Typically, rinse (decontamination) blanks can be used to evaluate the potential effects of cross contamination, if needed. Collected decontamination fluids will be treated using the New Cricket Spring treatment system.

3.2 SAMPLE LOCATION SELECTION

ISM samples are composed of increments collected from specific points throughout the DU. The positioning of the collection points can be set using one of three approaches: simple random sampling (SRS), random sampling within a grid, and systematic random sampling. SRS involves determining random locations across the entire DU. Note that "random" in this context does not mean wherever the sampling team feels like taking a sample and that a formal approach to determining the random increment locations must be used. With random sampling within a grid, the DU is overlain with a sampling grid and soil increments are collected from random locations determined in each grid cell. Systematic random sampling is similar except that only the initial grid cell sampling location is randomly determined and the same relative location is sampled in each of the other grid cells.

Statistical sampling theory predicts and sampling simulations have shown SRS to yield the most representative (least biased) estimate of the mean. However, it is also the least practical to implement since field staff have to navigate to predetermined locations non-uniformly positioned within the DU. SRS also may result in a sampling pattern that leaves large portions of a DU unsampled, which may not be acceptable to regulators, risk managers, members of the public, or other stakeholders. In practice, systematic random sampling is most often chosen for ease of implementation and to avoid the appearance of over- or underrepresentation of subareas within a DU (Incremental Sampling Methodology, Technical and Regulatory Guidance, February 2012).

A square or rectangular, or otherwise structurally defined DU is first subdivided or gridded-off into generally uniform cells or subareas based on the desired number of increments to be obtained. Using the systematic random design, a random position is established for a given cell, and then the same position is repeated in all of the remaining cells in the DU. The process is repeated for replicate samples; i.e., a new random position is established for the single collection point to be repeated in all of the cells. A Global Positioning System (GPS) device will be used to delineate the DU. It may or may not be necessary to determine the exact location of each increment depending on the DQOs specified during the systematic planning process.

The approximate corners of each DU will be marked with a wooden stake to assist with a visual delineation of the cells and subareas where increments are to be collected. Additional markers will be placed to assist in defining lanes and grids. The DUs will be established such that the conversions for the spacing (steps) between increment collection points (cells) is fairly straightforward to calculate. For example, SU in DUs 1, 2, 5, and 6 could be divided into five rows, with six increments collected from each row, with an initial random starting point.

Although ISM sample collection may be performed by a single individual, a two-person team is anticipated and is considered the most efficient method. The personnel duties in the two-person team include one person collecting the increments and the other person holding the sample container (e.g., clean polyethylene bag) and keeping track of the number of increments. Sampling tools will be pre-marked for the appropriate depth to assure consistent sample volume. Flags will be used to mark DU boundaries and to aid in visualizing the travel paths and/or to mark the actual increment locations. The ISM sampler will start in one corner or end of the DU and collects the increment at the predetermined positions in a serpentine or similar pattern to assure a sample is collected from each sub-area within the SU. For the systematic random sampling design, the location of the first increment is determined randomly, and subsequent increments are collected in the same relative location within each grid.

3.2.1 REPLICATE SAMPLING

In the field, replicate incremental samples will be taken to ensure reliable estimates of the mean concentration within the DU. Triplicate sampling is planned for one randomly selected SU of five SUs selected for sampling within DU #2 as outlined in Table 1.

Completely separate replicate ISM samples will be collected to statistically evaluate sampling precision for the DU. The increments will be collected in a systematic random method within grid locations within the DU and will be different systematic locations from those used for the initial ISM sample. The increments for ISM replicates will not be collected from the same locations or co-located with those used for the initial ISM sample. ISM field replicates are made of the same number of increments collected in the initial ISM sample and collected using the same sampling pattern from within the same DU. Furthermore; the replicate samples are prepared and analyzed in the same manner as the initial sample. Three replicate samples (i.e., the initial ISM sample plus two additional samples) will be collected. Replicate ISM samples will be submitted to the laboratory as “blind” samples, meaning the laboratory does not know they are replicate samples of the initial ISM samples.

3.3 FIELD SAMPLE CONTROL AND MANAGEMENT

Each ISM sample collected during the CSM sampling activities will be assigned a unique sample identification number to allow for proper data management. Sample numbers will be included on the sample label, in the daily field log book to identify notes pertaining to the sample, and on the Chain-of-Custody form. The samples will be labeled immediately following collection. The following information will be recorded on the sample label:

A. Sample identification number.
B. Date and time of collection.
C. Name of the sampler.
D. Sample collection location.
E. Requested analysis.

Indelible ink will be used on the labels. The labels will be firmly affixed to the sample container.

Each sample container will be placed inside a cooler with cushioning material added for protection during transportation. Ice will be utilized as a preservative and will be dispersed evenly inside the cooler. Tape will be placed around the cooler to prevent accidental opening and breaking the custody seal.

Written records of sample handling will be kept each time the samples change hands. The transfer will be documented on the Chain-of-Custody record for each person in custody of the samples.

Daily field log entries will be made using indelible ink with each page numbered. Information recorded in the log book will include, but is not limited, to the following:

A. Date and time of entry.
B. Sample number.
C. Date and time of sample collection.
D. Collector's sample identification notes.
E. References such as maps or photographs of sampling site.
F. Field observations.

Photographs will be taken to document work progress, sample collection, unusual sample appearances or locations, and any information deemed necessary by the Site Manager.

All Oxford environmental personnel have completed EPA/OSHA mandatory 40-hour training for work around hazardous materials per 29 CFR 1910.120.

Oxford anticipates using a modified level "D" personnel protective equipment requirement including cotton coveralls or cotton shirt/denim jeans, hard hat, safety glasses, steel-toed/steel-shank work boots, and disposable nitrile gloves.

3.4 COMBINATION AND PREPARATION OF SAMPLES

In general, individual soil increments typically weigh between 20 and 60 grams. The targeted final ISM field samples are expected to weigh between 1,000 and 2,000 grams. Additionally, note that sieving of soil samples to the <2 mm particle size will reduce the amount of soil mass available for preparation and analysis. The mass of the final ISM sample is expected to be sufficient for the planned analyses, any additional QC requirements, or repeat analyses due to unanticipated field, laboratory, and/or QC failures. The collected soil increment samples will be placed in laboratory cleaned and provided sampling containers. The samples will be preserved with ice and submitted to the laboratory under standard chain of custody procedures.

ISM sample processing techniques, including milling (if required) and representative subsampling, are designed to ensure that the mass of sample analyzed by the laboratory is representative of the DU or SU from which it was collected. These techniques will be performed at the chosen analytical laboratory and are performed to reduce data variability as compared with conventional sample handling and processing approaches. ISM sample processing will be performed in a controlled laboratory setting to minimize sampling errors and because of the impracticality and lack of availability to bring the required equipment to the Site.

Laboratory handling of the raw ISM field samples will include: air-drying (only if necessary) and sieving using a #10 sieve (<2 mm particle size). The sieved ISM sample will be spread out in a thin layer on a clean surface, e.g., a large, disposable, aluminum baking pan, allowing the entire

sample to be accessed. A subsample is then obtained by removing 30 or more equal increments from systematic random locations. The increments collected to form the subsample sample should equally represent the top and bottom of the processed material. This is achieved by using a rectangular, flat-bottom sampling tool with sides and a minimum 16 mm width, or equivalent. The mass of sample required for the analytical test or tests is used to determine the mass of each of the 30 or more increments. The entire submitted subsample mass must be prepared for analysis due to possible particle size discrimination during sample transit. If the entire contents of the submitted container are not to be analyzed, the laboratory must use proper techniques to ensure a representative particle size subsample is used for analysis.

4 QUALITY ASSURANCE

The data generated from the proposed sampling plan will be used to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). Sample analysis, data acquisition and review, data validation, and quality/usability assessments are described in the attached QAPP prepared for the sampling event.

FIGURES

Figure 1. Overview of All Seven Decision Units

Figure 2. Decision Unit 1 (DU 1), Uncapped Area East with Sampling Units Shown

Figure 3. Decision Unit 2 (DU 2), Capped Area With Sampling Units Shown

Figure 4. Decision Unit 3 (DU 3), Stormwater Ditch North and Decision Unit 4 (DU 4), Stormwater Ditch South

Figure 5. Decision Unit 5 (DU 5), Berm Area

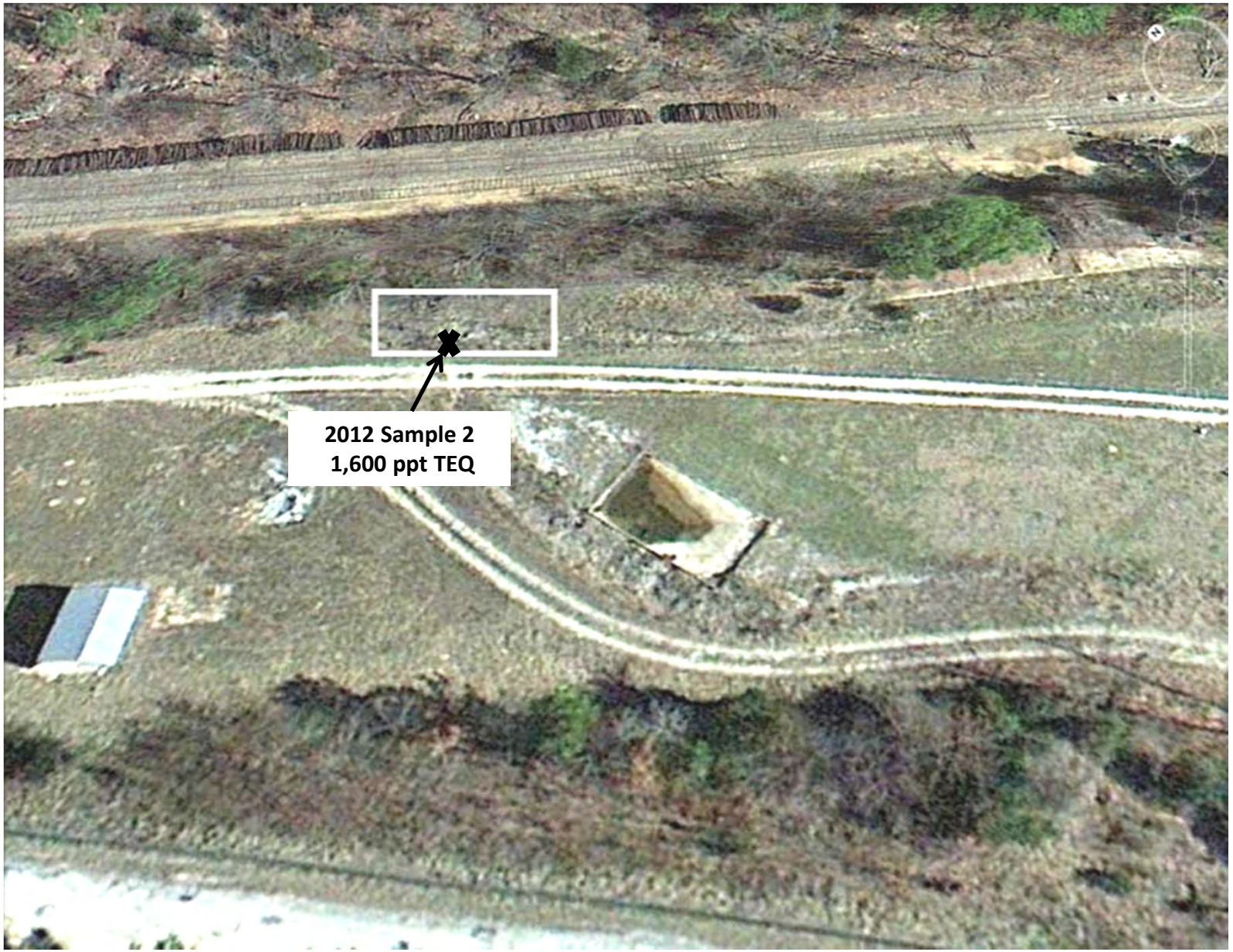
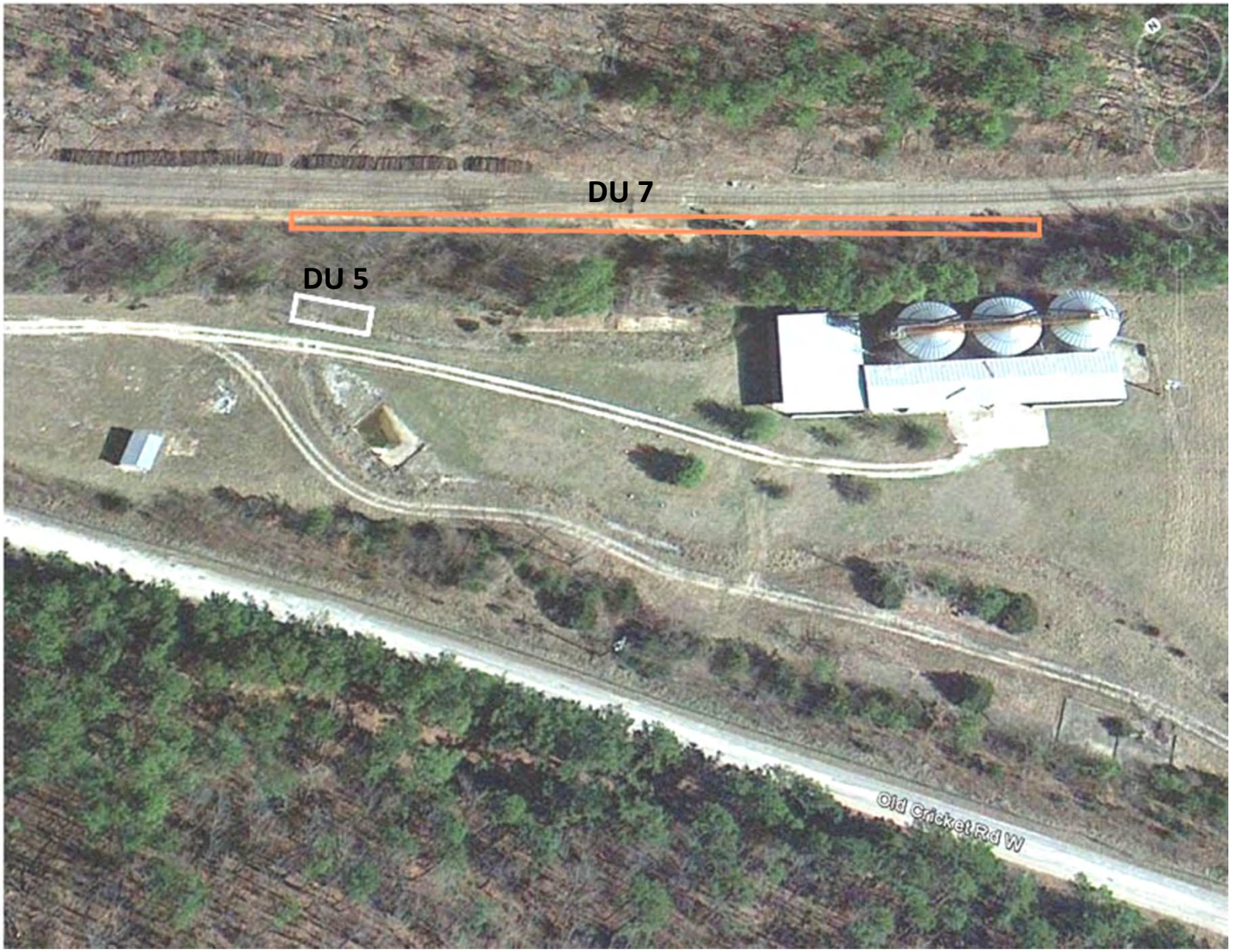


Figure 6. Decision Unit 6 (DU 6), Uncapped Area West with Sampling Units Shown

Figure 7. Decision Unit 7 (DU 7), Railroad Ditch



TABLES

Table 1. Summary of the Sampling Approach by Decision Unit[a].

Decision Unit Name	Area (acres)	Expected Heterogeneity	Expected Distribution of Increments	Number of Incremental Samples	Number of Increments	Description
DU 1 Uncapped Area East	1.2	Low to Moderate	Lognormal	3	30	DU will be divided into 5 SU of 0.25 acres. 3 SU will be randomly selected. 1 incremental sample of 30 increments will be collected from each selected SU. Heterogeneity expected to be low to moderate due to the lack of past site activities in this area.
DU 2 Capped Area	11	Low	Normal	8	30	DU will be divided into 44 SU of 0.25 acres. 8 SU will be randomly selected. 1 incremental sample of 30 increments from 7 SU. 3 incremental samples of 30 increments from 1 SU. Heterogeneity expected to be low because sampled soil will be from the clean cap.
DU 3 Stormwater Ditch North	0.14	Moderate	Lognormal	2	40	Ditch is divided evenly into 2 SU of approximately 233 m in length. 1 incremental sample of 40 increments to be collected from each SU. Increments will be collected from the bottom of the ditch approximately every 6 m over a combined length of 467 m.
DU 4 Stormwater Ditch South	0.17	Moderate	Lognormal	2	40	Ditch is divided evenly into 2 SU of approximately 280 m in length. 1 incremental sample of 40 increments to be collected from each segment. Increments will be collected from the bottom of the ditch approximately every 7 m over approximate combined length of 560 m.
DU 5 Berm Area	0.02	Moderate	Lognormal	3	30	DU is bounded to the north by the fenceline and to the south by the road. DU boundary to west is 10 ft from 1,600 ppt TEQ sample and boundary to the east is 50 ft from the same sample. 3 incremental samples of 30 increments. Entire area between main road and fenceline will be sampled including ditch bottom, sides, and horizontal surfaces in a similar plane as the road.
DU 6 Uncapped Area West	1.0	Low to Moderate	Lognormal	5	30	DU will be divided into 4 SU of 0.25 acres. 3 incremental samples of 30 increments from truck decontamination area (area closest to capped area). 2 SU of 3 remaining will be randomly selected for 1 incremental sample of 30 increments.
DU 7 Railroad Ditch	0.06	Low	Lognormal	1	30	DU is bounded to the south by the bottom of the hillside and to the north 5 ft from railroad track ballast. DU boundary to the west is 20 ft from 1,600 ppt TEQ sample and to the east is 460 ft from the same sample to the end of the former railroad ditch excavation area. 1 incremental sample of 30 increments.

[a] All samples will be collected from 0-6 inches from the surface.

Appendix

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

FOR:

Dioxin Re-Assessment
Arkwood, Inc. Superfund Site

August 2014

PREPARED FOR:

McKesson Corporation
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OXFORD PROJECT NO.: MCK-O&M-10005

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INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the activities of a sampling and analytical program associated with the dioxin re-assessment program involved with the acquisition of environmental information whether generated from direct measurements activities, collected from other sources, or compiled from computerized databases and information systems. The QAPP documents the results of a project's technical planning process, providing in one place a clear, concise, and complete plan for the dioxin re-assessment process and its quality objectives and identifying key project personnel. A QAPP communicates, to all parties, the specifications for implementation of the sampling and analytical process and to ensure that the quality objectives are achieved for the project. It does not guarantee success every time, but the prospects are much higher with a QAPP than without one.

The QAPP is divided into four basic element groups: Project Management; Data Generation and Acquisition; Assessment and Oversight; and Data Validation and Usability. Each group consists of standard elements that pertain to various aspects of the project. The QAPP addresses the basic elements defined and described by the following components:

- who will use the data;
- what the project's goals/objectives/questions or issues are;
- what decision(s) will be made from the information obtained;
- how, when, and where project information will be acquired or generated;
- what possible problems may arise and what actions can be taken to mitigate their impact on the project;
- what type, quantity, and quality of data are specified;
- how "good" those data have to be to support the decision to be made; and
- how the data will be analyzed, assessed, and reported.

A. Plan Distribution

All personnel involved in the dioxin re-assessment sampling and analytical project should retain or have access to the current version of the QA Project Plan. This may include the Project Manager, laboratory manager, field team leader, QA Manager, data reviewers, and any essential contractor and subcontractor personnel involved with the project. For the Arkwood Project, the QAPP will be distributed to:

- Ms. Jean Mescher, Project Coordinator, McKesson Corporation
- Mr. James Fleer, Operations and Maintenance Engineer, Oxford Environmental and Safety
- Mr. Brent Kerger, Ph.D., Senior Principal Health Scientist, Cardno Chemrisk
- Mr. Calvin Tanaka, Acting Quality Assurance Manager, Vista Analytical Laboratory

Project/Task Organization

The individuals participating in the project and their specific roles and responsibilities are discussed below:

Jean Mescher, Project Coordinator - the primary decision maker for the project and the primary user of the data to determine whether or not further action is required at the site under the direction of the USEPA. Ms. Mescher's duties are:

1. Overall responsibility for the site operations and activities
2. Communication with regulatory agencies and media
3. Reviewing and approving the QAPP and subsequent revisions in terms of program specific requirements
4. Reviewing reports and ensuring plans are implemented according to schedule
5. Making final project decisions with the authority to commit the necessary resources to conduct the project

James Fleer, Operations and Maintenance Engineer and Quality Assurance Manager (QAM) - The QAM will be responsible for development and implementation of the QAPP and subsequent revisions. The QAM will provide QA technical assistance to the Project Manager and will conduct QA audits of the project. At this time, no QAM audits are planned; however, the Project Manager can request an audit by the QAM.

The Operations and Maintenance Engineer will coordinate the project activities and specific responsibilities will include:

1. Developing the QAPP.
2. Coordinating field and laboratory activities.
3. Conducting the sampling activities in accordance with the QAPP and work order.
4. Validating the field data.
5. Reporting to the Project Manager regarding the project status.

Brent Kerger, Ph. D., Senior Principal Health Scientist, Cardno Chemrisk - Mr. Kerger is the primary end-user of the information and data generated by the sampling and analysis project and will be responsible for preparing end-product risk assessment materials and reports. Mr. Kerger will review project planning documents and procedures and provide input and clarification to the process and procedures to assure the end products will meet the needs and requirements for use in the risk assessment process. If field or analytical issues or problems are identified, Mr. Kerger will be informed and will provide input regarding methods to address the issues to minimize the impact on the risk assessment process.

Calvin Tanaka, Acting Quality Assurance Manager, Vista Analytical Laboratory - Mr. Tanaka is responsible for coordinating the laboratory processing and analysis of the samples and laboratory validation of the data. He will coordinate the receipt of the samples at the laboratory, select the analytical team, ensure internal laboratory audits are conducted per the Vista Analytical Laboratory QA Manual, and distribute the applicable sections of the QAPP and subsequent revisions to members of the analytical team. The complete Vista Analytical Laboratory QA Manual was reviewed by Oxford Environmental and Safety, Inc. in May 2014. Mr. Tanaka will also report laboratory problems affecting the project data to the Oxford Environmental and Safety, Inc. Operations and Maintenance Engineer and QA manager.

Task Description and Schedule

The objective of the sampling and analytical process at the Arkwood, Inc. site (Site) is to provide current data for the evaluation of dioxin-related health risks given recent changes in the toxicity criteria for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) (IRIS, 2012; USEPA, 2009). A Conceptual Site Model, prepared by Cardno Chemrisk (August 2014), evaluated the Site based on historical information regarding the past activities and information relevant to sources, transport pathways, and completed exposure routes that may be relevant to current and future site operation and use conditions. The evaluation identified seven Decision Units (DUs) for evaluation. Samples from the DUs will be collected in general accordance with the Incremental

Sampling Methodology (ISM) outlined in the Technical and Regulatory Guidance, Incremental Sampling Methodology, February 2012 prepared by The Interstate Technology and Regulatory Council (ITRC). This sampling and analytical process is anticipated to be a one-time event/process.

Soil samples will be collected by using calibrated soil coring equipment. Soil samples will be collected from the upper six inches of soil at all sampling locations. Soil samples will be collected in accordance with the process and procedures outlined in the Workplan for the project activity.

Non-critical data may be collected and may include weather conditions, general soil composition information, or other information deemed pertinent by the sampling team. This information may be used to supplement the analytical data.

A complete equipment list is provided in section B. Standard one-gallon Zip-loc bags will be used for collection of the individual soil samples. One Zip-loc bag will be used for all samples collected from within a Sampling Unit. See the Specialized Training Requirements/Certification section below for personnel requirements.

The assessment tools needed for this project will include data verification and validation of all data submitted to the EPA Project Manager. The sample collection activity will be performed once. Sampling is anticipated during the fall of 2014.

Required QA records are described in the Documents and Records section below. Laboratory QA records will be developed and maintained in accordance with the laboratory QA manual. QA reviews will be performed by the QAM on an “as-needed” or “as-requested” basis. QA reviews will be maintained within the Project files.

A discussion of standard operating procedures identified in the QAPP can be found in Section B.

Data Quality Objectives for Measurement Data
Valid data of known and documented quality is needed to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-TCDD.

The null hypothesis is that prior remediation activities have addressed exposure concentrations such that no unacceptable exposure threats remain at the Site provided the Site cap is undisturbed. For the surface soil matrix, the lower bound of the expected 2,3,7,8-TCDD equivalency is 0 ppt TEQ and the upper bound is unknown but is anticipated to be less than 730 ppt TEQ.

Data Quality Indicators:
If the collected data are within the expected bounds described above, the following data quality indicators will be applicable and remediation decisions can be made with this data. The soil sampling program is anticipated to be a one-time event. Data quality indicators include precision, accuracy, representativeness, comparability, and completeness. Definitions for each of these data quality indicators can be found in Attachment A.

Precision. The precision at this site will be calculated as the relative percent difference (RPD) for laboratory duplicates (matrix spike/matrix spike duplicates) for the soil

samples. The frequency for laboratory duplicates is one sample per event. The acceptance criteria for the laboratory duplicates are defined in the laboratory QA manual. One field triplicate of the soil sample at one SU will be collected during this sampling event for use in the QA process. The laboratory Project Manager will evaluate the replicates during the review and verification process.

Accuracy. Accuracy will be determined for 2,3,7,8-TCDD in soil with a performance evaluation (PE) sample, analyzed to determine any possible bias. The laboratory will analyze a matrix spike to verify the effect of the matrix on analytical bias. The percent recovery for the PE sample (matrix spike) will be calculated and the acceptance criteria are defined in the laboratory QA manual

Representativeness. Representativeness will be assured by the sampling process using ISM techniques.

Completeness. To generate complete data, 100% of the samples must be collected and analyzed. Re-sampling is not anticipated.

Comparability. For this project, comparability will be addressed through the use of common and accepted sampling and analytical techniques and by reporting data in standard units.

Special Training Requirements/Certification

Specialized training for field sampling and analyses and off-site analyses and validation has not been identified as necessary during the planning of this project. The Oxford field team lead will be responsible for ensuring that all members of the field team have valid and current specialized training required by the OSHA regulations. The EPA Project Manager will be responsible for ensuring that all EPA personnel have valid and current specialized training required by the OSHA regulations as a pre-requisite for site visit(s). Specific certifications have not been identified as necessary during the planning of this project.

Samples will be transported from the site and shipped to the lab as directed by the Workplan prepared by Oxford. These transporting and shipping procedures will be in compliance with the Department of Transportation regulations.

Documents and Records

The records for this project will include miscellaneous correspondence, field logs and field data worksheets, and laboratory analytical reports. Field logs will be recorded with no more than one entry per page. Field logs will include observations about weather conditions at the site when samples are collected and field analyses are conducted. Any other pertinent observations or deviations from the procedures in this QAPP deemed noteworthy by any member of the field team will also be recorded in the field log book. Field data worksheets will be used to record all field measurements. Each page of the field logs and field data worksheets will be dated and signed by the person making the entries.

Laboratory analytical reports will be generated on a “batch” basis. Each sample shipment will constitute a batch for reporting purposes. All samples received by the laboratory will be signed by a designated representative of the laboratory. The analytical data report will include an original signed report of the analytical results, a tabular report about the analysis, complete chain of custody form, and any other documentation received with the samples. A summary of the calibration data and laboratory quality control data will also be included in the analytical

report. The raw analytical data (e.g., instrument printouts and manual records) will be available upon request. The laboratory analytical report will be submitted to Oxford. Oxford will review the analytical report and submit the report to the Project Manager within ten calendar days after receipt of the analytical data and upon verification of its completeness. The tabular report will describe at least:

1. the dates of sample receipt, preparation, and analysis,
2. the condition of the samples upon receipt,
3. sample preparation and analytical procedures,
4. any problems encountered during sample handling, storage, preparation, or analysis, and their solutions,
5. any deviations from standard operating procedures, and,
6. information regarding the quality of the reported analytical.

B. Sampling Process Design

This is a sampling and analytical program to provide data necessary to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-TCDD. The sample collection design was developed in cooperation with the EPA and the State of Arkansas relative to development of DUs and agreement regarding SU and in general accordance with the Technical and Regulatory Guidance for ISM dated February 2012. A summary of the DUs and SU including anticipated heterogeneity is included in the Workplan for the sampling and analytical program. Use of standard methods and technically accepted methods will assure that data may be comparable to other sources of data. See Attachment A for a site map.

Schedule

Sample collection will occur on a one-time basis and is anticipated to be completed during the fall of 2014. Sample collection will be performed between Monday and Thursday to allow for shipping to and receipt by the analytical laboratory during normal business hours. If sample shipment cannot be performed between Monday and Thursday, special receiving arrangements can be made with the laboratory for after-hours receiving. After-hours receiving must be arranged prior to performing the sampling event. The samples will be shipped overnight to the analytical laboratory for analysis. Laboratory results will be sent to the Oxford representative within 30 days of sample receipt.

Equipment

1 or more calibrated soil coring devices designed to obtain a minimum ¾ inch diameter sample
1 one-gallon size Zip-loc bag for each collected sample
Flags and markers as required to identify boundaries and provide guides during the sampling process
1 Cooler for shipment of soil samples
Field sheets
Decontamination containers and supplies

Procedure

Sampling procedures are detailed in the Workplan.

Sampling Methods Requirements

Soil samples will be collected using ISM techniques to determine a reasonably unbiased estimate of mean contaminant concentrations in a volume of soil targeted for sampling. ISM provides representative samples of specific soil volumes.

Analytical Methods Requirements

The measurement of dioxin congeners in the samples will be performed at the analytical laboratory. Table 1 summarizes the analytical methods to be used.

Once the samples are received and logged in at the laboratory, the samples will be analyzed using EPA Method 1613. EPA Method 1613 describes the sample preparation and quantitation of chlorine-substituted dibenzo-p-dioxins and dibenzofurans into the low parts-per-quadrillion range for aqueous matrices and the low parts-per-trillion range for solid matrices. Laboratory procedures describe the sample analysis including analytical method performance criteria and corrective actions for analytical failures. If any data are lost or do not meet the method

performance criteria, the analytical laboratory QA Manager will contact the Oxford QAM prior to submission of the data.

Table 1. Summary of Methods

Analyte	chlorine-substituted dibenzo-p-dioxins
Matrix	Surface soils
Project Action Limit	730 ppt TEQ
Project Quantitation Limit	~<1.0 pg/g per congener
Analytical SOP Analytical Method	EPA Method 1613

Quality Control Requirements

The laboratory quality control (QC) procedures and associated criteria are contained in the laboratory QA manual. The laboratory QC samples and control limits identified in the manual were reviewed by the project personnel. The quality of the data generated using the QA manual will provide analytical data of a sufficient quality for this project. The QC samples will include a matrix spike added to a sample prepared similar to the collected samples.

Laboratory Quality Control

The lab will be required to analyze a method blank, a matrix spike, and calibration curve verification (CCV) sample for each matrix. The method blank must be below the reporting limit; the CCV and the PE sample must be within the accepted range of values.

Instrument/Equipment Testing, Inspection, & Maintenance Requirements

The only field equipment requiring testing, inspection, and maintenance is the soil coring equipment. The sample coring equipment will be used to collect each sub-sample within the SU. There are no testing parameters for use or calibration of the equipment. The calibration for the coring equipment will include a mark at the level equivalent to two inches in depth for the soil sample. Inspection and maintenance activities for the coring equipment are limited to decontamination procedures to make sure cross-contamination between SUs does not occur.

An inspection checklist will be completed by a field team member immediately prior to use within a SU to assure the instrument is marked for consistency in volume and appears clean and free of soil, debris or other indications of potential contamination. A maintenance kit which includes commonly needed spare parts, if any, marking materials to maintain desired depth indicators, and decontamination materials will also be maintained at the Site during field activities. Any preventive or corrective maintenance done will be documented in the equipment log.

The laboratory QA manual addresses the testing, inspection, and maintenance for the analytical instrument(s). These procedures include reviewing the instrument log for any notations regarding problems experienced during the previous use and verifying the preventative maintenance has been completed per the manufacturer's recommendations. Any preventive or corrective maintenance done will be documented in the maintenance log.

Instrument Calibration & Frequency

The soil coring device(s) will be etched or marked at the approximate two inch core level to assure uniform soil sample size. The etchings/markings will be visually inspected prior to each use and after decontamination to verify the etchings/markings are maintained throughout the sampling process.

The analytical instrument(s) will be calibrated using NIST standards at a frequency per laboratory QA manual and manufacturer's recommendation.

Inspection/Acceptance Requirements for Supplies and Consumables

The field team leader will be responsible for inspecting sample containers before leaving for the field. Only new sample containers will be used. The sample containers will also be inspected for rips, tears, and other obvious defects before use and will be discarded if defects are found to be present.

The analytical laboratory analyst assigned to conduct the analysis will be responsible for inspecting equipment and supplies upon receipt. The manufacturer's specifications for product performance and purity will be used as the acceptance criteria.

Data Management

Data for this project will be produced in two locations: onsite and at the analytical laboratory. Data collected onsite will be recorded on field data worksheets. These field data worksheets will be retained and maintained by Oxford and will become a part of the project file. Laboratory data will be submitted by the analytical laboratory to the Oxford Project Manager within 30 calendar days of the laboratory's receipt of the samples. The Oxford Project Manager will be responsible for ensuring the analytical report meets the requirements of the Project. Adherence to these procedures will assure that applicable information resource management requirements are satisfied.

C. Assessment and Response Actions
The assessments planned for this project include the verification and validation of all reported data.

The tabular report included with each laboratory data report will include information regarding the quality of the reported laboratory data, which will result from the analytical laboratory's audit of data quality according to the laboratory QA manual. The analytical laboratory will be responsible for corrective actions at the laboratory. The tabular report will include information regarding the quality of the reported data. These procedures address the process and criteria for evaluating data, and processes for addressing the requirements of specific project. The Oxford QAM will review the results from the Performance Evaluation sample(s) and all reported data to verify that it is useable for the purposes of this project, and that it is reasonable when taken with other facts known about the site. Section D of this QAPP discusses the verification and validation process.

Reports to Management
Project reporting will include forwarding the reviewed and validated analytical report to the Project Coordinator and Senior Principal Health Scientist. The Senior Principal Health Scientist will utilize the data to evaluate risk assessment compliance of the remediated Site given recent changes in the toxicity criteria for 2,3,7,8-TCDD.

Any significant QA problems encountered in the laboratory or in the field, as deemed by the analytical laboratory or the Oxford QAM (respectively), will be reported immediately to the Oxford Project Manager via telephone.

D. Data Validation and Usability

Data will be accepted if they meet the following criteria:

1. Field data sheets are complete.
2. Field data and laboratory data were validated
3. Sample locations and collection procedures match the proposed sample locations and collection procedures identified in the Workplan.
4. Sample handling procedures documented on chain-of-custody forms and tabular report match the proposed sample handling procedures identified in section B.
5. Field QC was conducted as planned and meets the acceptance criteria established in section B.

Any deviations from the QAPP are to be reported in the field data sheets or analytical data report and the analytical data report will include the information described in section A.

If the data fails to meet the criteria, they will be flagged by the analytical laboratory Quality Assurance Manager as estimated. Any flagged data will be discussed with the project team to determine if the data point will be rejected.

Data Validation and Verification

The Oxford QAM will validate the field data according to this plan. Any problems identified during this process will be reported to the Project Coordinator.

The analytical laboratory will validate the laboratory data according to the laboratory QA manual. Any problems identified during this process will be reported to the Oxford QAM in the analytical data report.

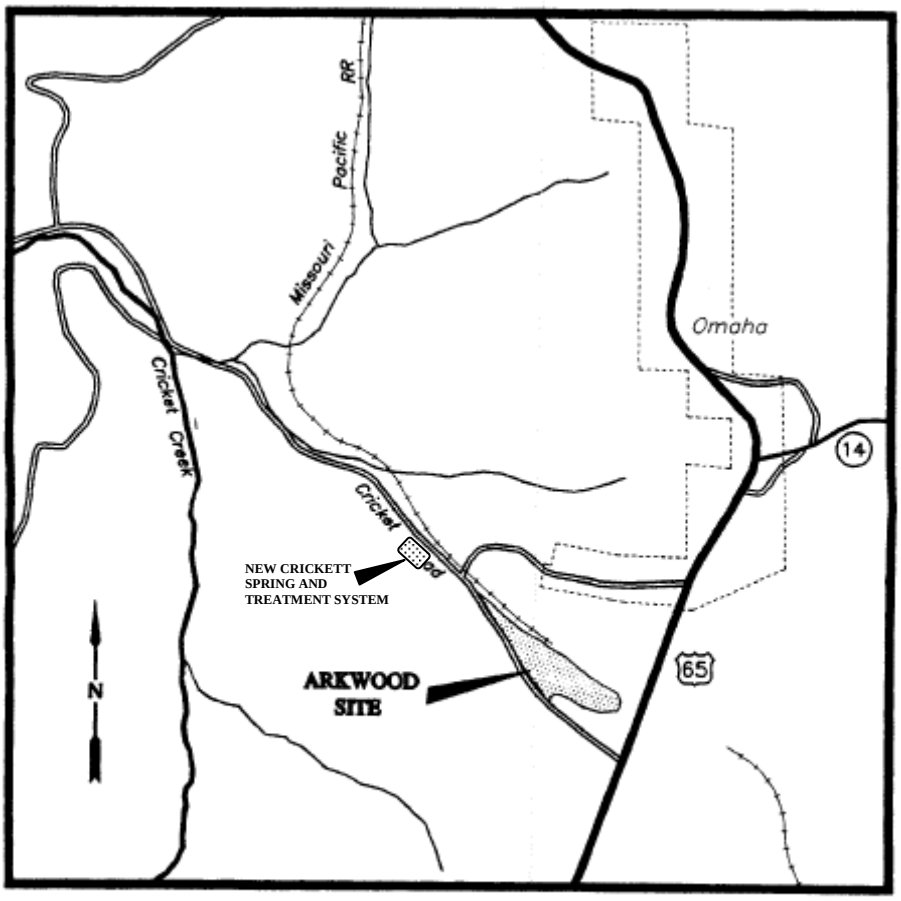
The Oxford QAM will review and verify the field sheets and the analytical data report. Any problems or deviations identified will be discussed with the project team.

Reconciliation with Data Quality Objectives

The Oxford Project Manager will review the analytical data reports and field sheets and reconcile the data with the data quality objectives outlined in this plan. Any significant deviations will be reported to the Project Coordinator, analytical laboratory and the field team to address the deviation(s) and either assure compliance with the plan or make appropriate changes to the plan or underlying documents.

APPENDICES

Diagram of Site Location



GENERAL AREA MAP